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ABSTRACT

This document incorporates the findings of a project initiated to find solutions to the problems of planning, designing, constructing, and utilizing facilities to house career education on the part of educational administrators. Traditional solutions, continually increasing costs, and the need for greater emphasis on the learning environment provided the impetus for focusing attention on the options for local determination with minimum emphasis on regulating procedures. This document explores questions that should be asked about the construction of a career preparation center--whether it be a new building, an addition, or the remodeling of an existing facility. Some of these probes concern the kind of building to be built, the method to be used in its construction, and whether time and/or cost are of the utmost importance. In answer to such questions, the author explores some of the new concepts that have been emerging and developing in the construction process, such as systems building, fast track scheduling, construction management, and the "recycling" of existing buildings. Citations are provided in each case for further reading on the subject. (Author/MLF)

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SPACES FOR
CAREER PREPARATION

CONSTRUCTION OPTIONS

by Linn Smith

MICHIGAN CAREER EDUCATION FACILITIES PROJECT

Author **LINN SMITH, FAIA,** is president of Linn Smith • Demiene • Adams • Inc., Birmingham, Michigan. He has served as a Director of the American Institute of Architects, President of the Michigan Society of Architects and President of the National Architectural Accrediting Board. Among honors received are the George G. Booth Traveling Fellowship in Architecture, Fellowship in AIA, the Gold Medals of both the Detroit Chapter AIA and the Michigan Society of Architects, the Outstanding Achievement Award of the University of Michigan and listing in Who's Who in America.

Additional copies of this publication, or others in the series of documents on Sapces for Career Preparation, may be obtained from:

Council of Educational Facility Planners, Int'l.
29 West Woodruff Avenue
Columbus, Ohio 43210

$3.00

1973

ACKNOWLEDGMENTS

In January of 1972, The Continuing Education Service, Michigan State University, initiated a research project to become known as the Michigan Career Education Facilities Project. Funding for the Project was made available by the Vocational Education and Career Development Service, Department of Education, State of Michigan.

The relative newness of the Career Education Movement and the recognized need for planning, designing, constructing and utilizing facilities to house Career Education on the part of the educational administrators, facility planners and designers was evident. Traditional solutions, continually increasing costs and the need for greater emphasis on the learning environment prompted the State Educational Agency to give maximum attention to the options for local determination with minimum emphasis on regulating procedures. Hopefully, they will find this series of documents viable tools in their efforts.

The Committee on Architecture for Education, American Institute of Architects, reviewed the Project in its early stage and designated Les Tincknell of Wigen, Tincknell and Associates, Inc., Saginaw, Michigan, as its representative and liaison to the project.

C. Theodore Larson, Professor Emeritus, School of Architecture and Design, University of Michigan, was designated as an architect-educator advisor to the project.

A *first* step resulted in the designation of an Advisory Committee to assist in the development and evaluation of the project. Members included:

William Chase, Program Officer
U.S. Office of Education
National Center for
Educational Technology
Washington, D.C.

Richard Featherstone, Professor
Administration and Higher Education
College of Education
Michigan State University
East Lansing, Michigan

Dwayne Gardner, Executive Director
Council of Educational Facility
Planners, International
Columbus, Ohio

Ben Graves, Project Director
Educational Facilities Laboratories, Inc.
Chicago, Illinois

Milton Miller, Director
Educational Facilities Planning
Grand Rapids Board of Education
Grand Rapids, Michigan

Donald Leu, Dean
School of Education
San Jose State College
San Jose, California

The *second* step involved the appointment of an architectural-planning team whose primary responsibility was to study the recognized needs and propose options for solving local career

facility problems. The team included:

William E. Blurock
William Blurock and Partners
Corona Del Mar, California

C. William Brubaker
Perkins & Will Architects, Inc.
Chicago, Illinois

Stan Leggett
Stanton Leggett and Associates, Inc.
Chicago, Illinois

Linn Smith
Linn Smith, Demiene, Adams, Inc.
Birmingham, Michigan

Peter Tarapata
Tarapata-MacMahon-Paulsen Corporation
Bloomfield Hills, Michigan

The *third* and *final* step in the Project involved the final editing, publication and dissemination of the project findings. This is one of a series of five publications to be released to educators, planners and architects. The series include:

Document 1 Objectives and Options by William E. Blurock
Document 2 The Process of Planning by Stanton Leggett
Document 3 Facility Options by C. William Brubaker
Document 4 Planning for Change by Peter Tarapata
Document 5 Construction Options by Linn Smith

Special acknowledgment is due Robert Pangman, State of Michigan, Department of Education, for his assistance and guidance throughout this project; to William Weisgerber, State of Michigan, Department of Education, and to Casmer Heilman, College of Education, Michigan State University, for their assistance in critiquing and editing these documents; to the Michigan Middle Cities Education Association for their review and critique of the five documents; and to the Council of Educational Facility Planners, International for the printing and dissemination of the publications.

Project Co-Directors:

Floyd G. Parker, Director
Program and Staff Development
The Continuing Education Service
Michigan State University

Robert Paullin
Occupational Specialist
Division of Vocational Education
Department of Education
State of Michigan

THE QUESTIONS

Needs have been examined, a program has been developed, alternative facilities have been investigated and characteristics of spaces have been considered.

What are the questions that should now be asked about building a Career Preparation Center—whether a new building, an addition or the remodeling of an existing facility?

WHAT KIND OF BUILDING SHOULD WE BUILD?

- Should it be "universal" space, as described in PLANNING FOR CHANGE? Should it be unencumbered space with the kind of versatility described there?
- Should it be an OPEN PLAN? Are there related activities that can share large spaces and equipment with a minimum of separate rooms?
- Should it be FLEXIBLE? Should it be possible to make spaces larger or smaller quickly and easily?
- Should it be ADAPTABLE? Will programs change—new ones be added and old ones phased out—over the years, altering space requirements?

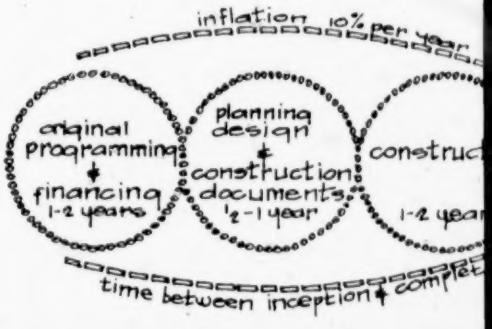
HOW SHOULD WE GET IT BUILT?

- Is TIME CRITICAL? Is there an urgency to have the building in operation as soon as possible?
- Is COST a major consideration?

WHAT IF THE ANSWERS ARE YES?

If the answers are yes, some of the recent developments in school construction should be seriously considered. While these are not really new techniques—having been used for ye and commercial building—their appli building is relatively new.

It has become more and more difficu several years to get anything built. I uncommon today, for example, for a take four to six years to build from th established until occupancy. This ha buildings which are obsolete—both e physically—by the time they are com importantly, steady inflation (10 - 12 escalates construction cost or require the quality or the quantity of the buil become obvious that the normal cons is performing unsatisfactorily.


inflation 10% per year
original programming + financing 1-2 years
planning design + construction documents ½-1 year
construct
1-2 year
time between inception + complet

In response to these problems, the ne have been emerging and developing i construction process are:

- The use of a "systems" concept in t construction of buildings.
- The use of "fast-tracking" and "cons management" concepts to accelerat and construction of buildings.

These are OPTIONS which those invo career preparation facilities should be which they should consider.

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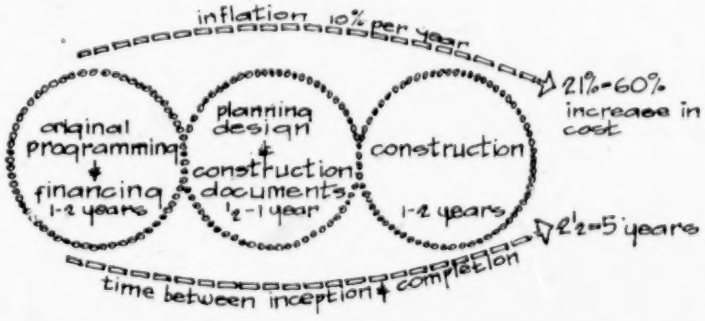
techniques—having been used for years in industrial and commercial building--their application in public building is relatively new.

It has become more and more difficult over the past several years to get anything built. It is not uncommon today, for example, for a high school to take four to six years to build from the time a need is established until occupancy. This has resulted in buildings which are obsolete—both educationally and physically—by the time they are completed. More importantly, steady inflation (10 - 12% per year) escalates construction cost or requires a reduction in the quality or the quantity of the building. It has become obvious that the normal construction process is performing unsatisfactorily.



In response to these problems, the new concepts that have been emerging and developing in the construction process are:

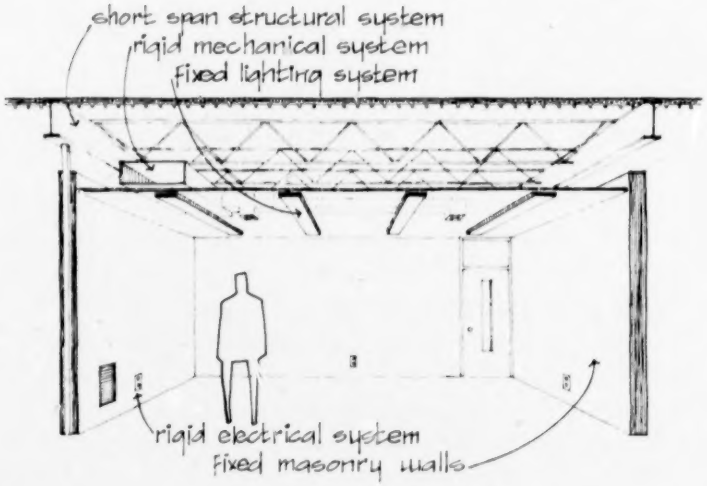
- The use of a "systems" concept in the design and construction of buildings.
- The use of "fast-tracking" and "construction management" concepts to accelerate the planning and construction of buildings.

These are OPTIONS which those involved in providing career preparation facilities should be aware of and which they should consider.

HOW IS A BUILDING TRADITIONALLY DESIGNED?

Educational specifications have traditionally defined building programs largely in terms of "spaces" of specified sizes within which activities are to take place. These specifications are often interpreted literally, with each required "space" becoming a fixed, rigid room. The manner in which these rooms are arranged determines the shape of the building and affects its appearance. The building as a whole becomes fixed and rigid, lacking flexibility and adaptability. Walls are often used to support the roof; the structure is designed around the various shapes with a variety of sizes and lengths; the mechanical systems are designed to heat and cool each specific room; lighting layouts are done on a room-by-room basis.

The result? A building designed specifically to accommodate an original program, with little ability to change and grow with future needs. Future users are boxed-in, with changes required by changing or added programs difficult, time consuming and expensive.



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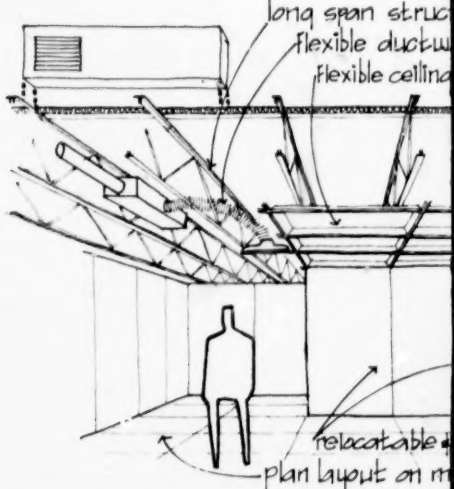

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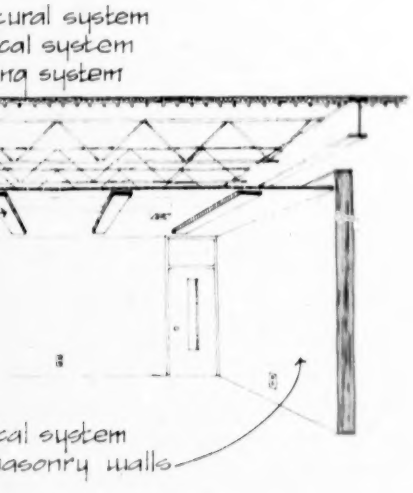
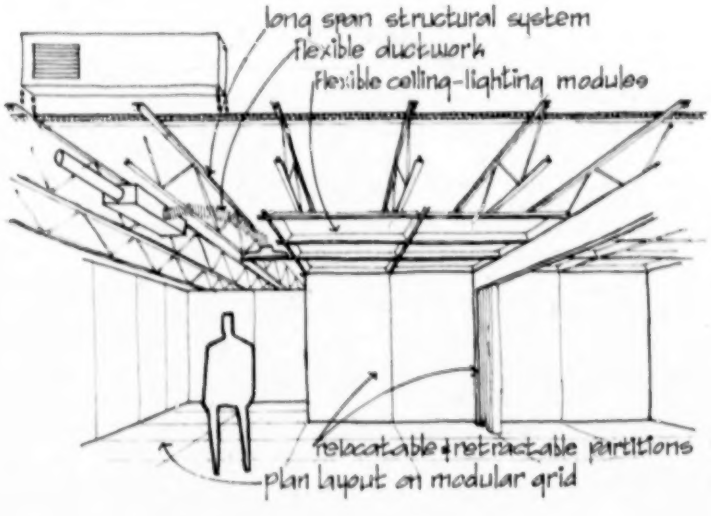


HOW IS A SYSTEMS BUILDING DESIGNED?

In the systems approach, the educational specifications are interpreted as describing (if they have not been written that way) a series of "activities" rather than "spaces." Activities which are related—either by program, by type of space required, or by commonality of equipment—are grouped in large blocks. These blocks establish the structure, providing large open areas with long spans and few columns. These areas can be left open—much as in an auto service facility or a large office or they can be divided into "spaces" as required. The dividers can be any one of a number of easily relocatable types. The building then becomes a series of these open areas with interior space divided in a way that provides a great deal of flexibility and adaptability. The mechanical system provides heating and cooling for reasonable sized zones with the capability of rearrangement for changed space divisions. Lighting is an overall layout which similarly accommodates change.



The result, with this OPTION? A building which is designed for today's program, but which will easily accommodate tomorrow's and all future variations just as well. It is a building which is alive, which can change and change again, which can grow as education changes and grows. And it can do this easily, quickly and inexpensively.

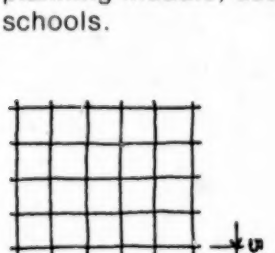
WHAT ARE SYSTEMS?

The total systems concept is extremely complex and involved, with a language all its own. Much of the development in the SYSTEMS field has come through large volume, well funded research projects, each of which have included a number of individual buildings. These research projects (SCSD, SEF, RAS) have analyzed programs and needs, from which have been developed definitive performance specifications. These performance specifications establish what a lighting system, partitioning system or a structural system is to accomplish, rather than specifying a specific light fixture, partition or even the material to be used in the structure. The volume of work involved (and the resulting size of the potential contract) has made it possible for manufacturers to develop new products or modify existing products to meet these performance criteria. Many of these products, including those developed by unsuccessful bidders, have become standard, off-the-shelf items of the various manufacturers. The use of these products reduces on-site labor, with a resultant savings of time and money and with improved quality.

As a result, many individual schools have been built on a SYSTEMS basis (it is estimated there are over 500, of which probably not more than 100 are a part of the pilot projects) using these products. Most, if not all, of the CAREER CENTERS to be built in Michigan will be individual projects so for our purposes we can define SYSTEMS in fairly simple terms.

SYSTEMS building, in its limited s
individual buildings, consists of T
CONCEPTS:

ONE: It is a planning discipline w
planning module, usually 5
schools.



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example:

- Standard structural memb
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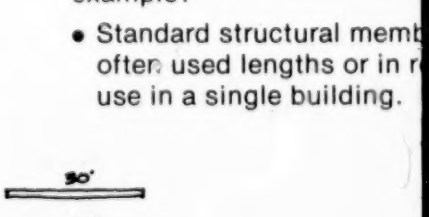

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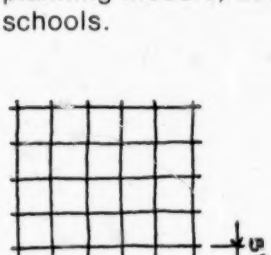
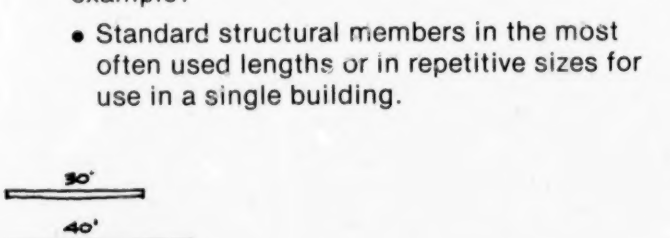
SYSTEMS building, in its limited sense for use in individual buildings, consists of TWO BASIC CONCEPTS:

ONE: It is a planning discipline which utilizes a planning module, usually 5' x 5' for schools.

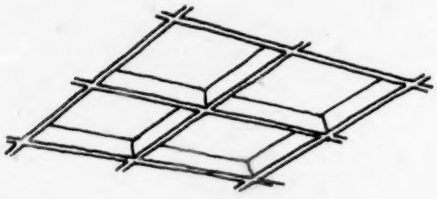


The use of this module gives a sense of orderliness to the planning process, which is often absent in non-systems work, and also makes it possible to develop a series of standard sized parts for construction. For example:

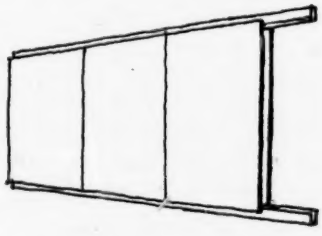
- Standard structural members in the most often used lengths or in repetitive sizes for use in a single building.



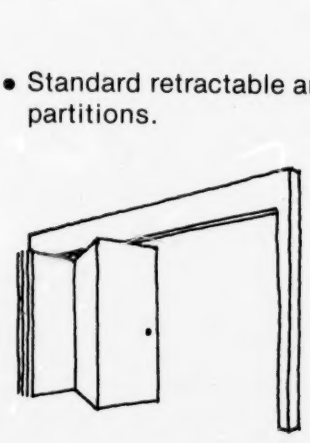
- Standard 5' x 5' ceiling-lighting modules.



- Standard interior partition units.

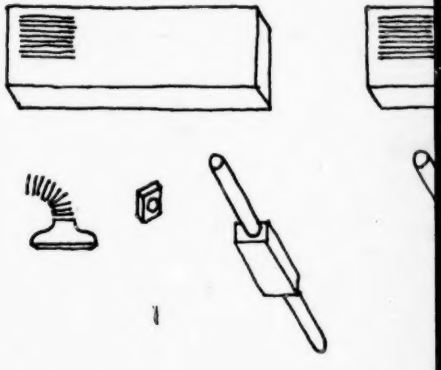


- Standard retractable and/or relocatable partitions.



TWO: It is a planning and constr
integrates a series of parts
specially designed produc
in a logical and rational m
parts when used together
of a building is called a BU

BUILDING SYSTEMS are n
SUBSYSTEMS, which are
system designed for a spe
composed of components
such as motors, fans, ther
etc.) and materials require
function.

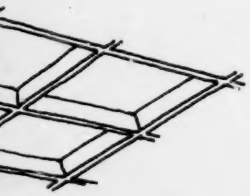


The most common SUBSY
use for school constructio

- STRUCTURAL SUBSYST
- CEILING-LIGHTING SUB
- HEATING, VENTILATING
  CONDITIONING SUBSYS
- INTERIOR SPACE DIVISI

These four SUBSYSTEMS
40-50% of the constructio

5' ceiling-lighting modules.

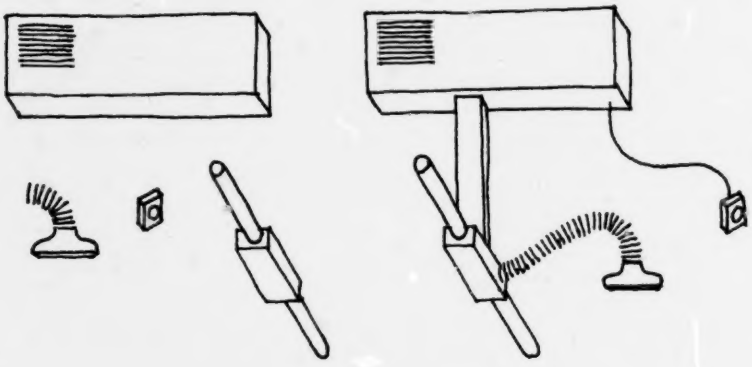


erior partition units.

actable and/or relocatable

TWO: It is a planning and construction process which integrates a series of parts, many of which are specially designed products for systems use, in a logical and rational manner. This set of parts when used together to form a major part of a building is called a BUILDING SYSTEM.

BUILDING SYSTEMS are made up of SUBSYSTEMS, which are a part of a building system designed for a specific function and composed of components (the individual parts such as motors, fans, thermostats, diffusers, etc.) and materials required to fulfill that function.



The most common SUBSYSTEMS currently in use for school construction are:

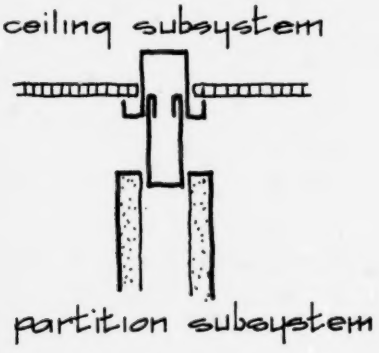
- STRUCTURAL SUBSYSTEM
- CEILING-LIGHTING SUBSYSTEM
- HEATING, VENTILATING, AIR CONDITIONING SUBSYSTEM
- INTERIOR SPACE DIVISION SUBSYSTEM

These four SUBSYSTEMS will usually make up 40-50% of the construction cost of a building.

There are two terms commonly used in talking about systems that should be understood:

COMPATIBILITY: The ability to coordinate—functionally, dimensionally, economically and esthetically—two or more different subsystems components.

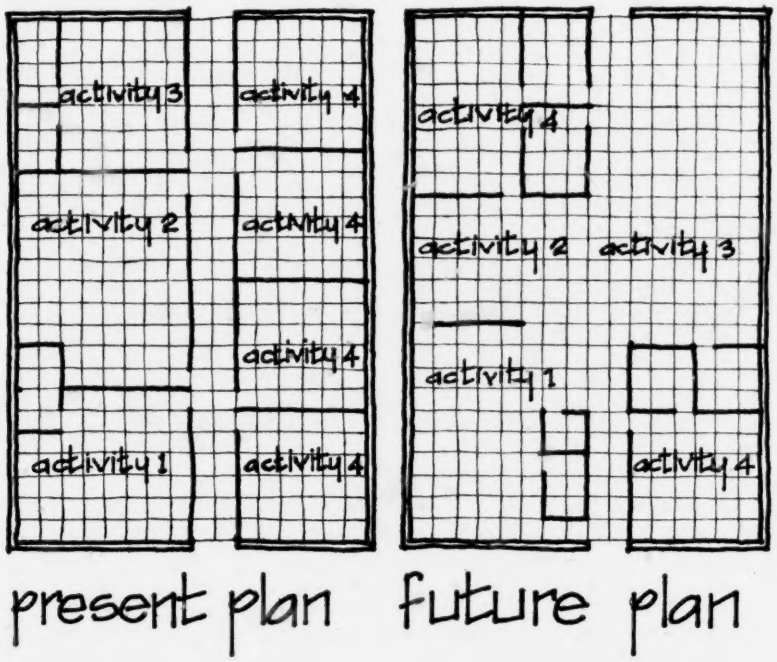
INTERFACE: A common boundry or connection between subsystems. Every effort is made to keep this juncture as simple as possible eliminating the custom work of cutting, trimming, fitting and patching.



WHY USE SYSTEMS?

A facility which is conceived and developed following the SYSTEMS concept is a living responsible facility with the ability to grow and to change.

- Large, uncluttered areas without permanent obstructions.
- Variable, adaptable space within these areas which can be rearranged at will as needs change.
- Variable, adaptable environmental systems (heating, cooling, lighting) to change as spaces change.



The educational process of tomorrow becomes as important as that of today and can be as well accommodated.

QUESTIONS-ANSWERS-INFORMATION

SOME COMMON QUESTIONS ABOUT SYSTEMS

Does the use of a systems approach restrict the owner or the architect?

Not really. Using a 5' x 5' module is more limiting than using no module, but any compromises that have to be made are usually minor. If major problems do arise, it is always possible to make a portion of the building nonsystems.

Do not all systems buildings look alike?

No. The exterior skin of a building is not usually a subsystem. Consequently, the design and material can be whatever is desired.

Will we save a lot of money using systems?

Probably not. The systems concept, in itself, was not conceived to save money. It was intended to improve quality, in such things as increased flexibility and adaptability, air conditioning, etc. Some systems projects have achieved modest savings because of repetitive purchasing and manufacturing and most have improved quality without increasing overall cost.

WHERE CAN I LEARN MORE ABOUT SYSTEMS?

READ:

SYSTEMS An Approach to School Construction—Educational Facilities Laboratories, 477 Madison Avenue, New York, New York 10022.

SCSD: The Project and the Schools--Educational Facilities Laboratories, 477 Madison Avenue, New York, New York 10022.

"Systems and Other Techniques to Get Better Buildings Faster for Less"—*American School and University,* May, 1972, Page 9.

WRITE:

SCSD—California—John Boice, Director, BSIC/EFL 3000 Sand Hill Road, Menlo Park, California 94025

SEF—Toronto—Peter D.J. Tirion, Technical Director Metropolitan Toronto School Board, 155 College Avenue, Toronto 2B, Ontario, Canada

RAS—Montreal—Therese L. Roux, Chairman Montreal Catholic School Commission, 3737 Sherbrooke Street East, Montreal 36, Quebec, Canada

CSP—Detroit—Wallace B. Cleland, Director, 51 Wes Hancock Avenue, Detroit, Michigan 48201

SSP—Florida—Harold L. Cramer, Director Department of Education, State of Florida, Tallahassee, Florida 32304

BOSTCO—Boston—Robert J. Vey, Director, Boston Public Facilities Department, Boston, Mass. 02201

VISIT:

CSP in Detroit is of particular interest in Michigan. There are four projects, additions to existing buildings, which combined systems with accelerated construction techniques (discussed later). The additions contain specialized facilities, many with a vocational—technical orientation.

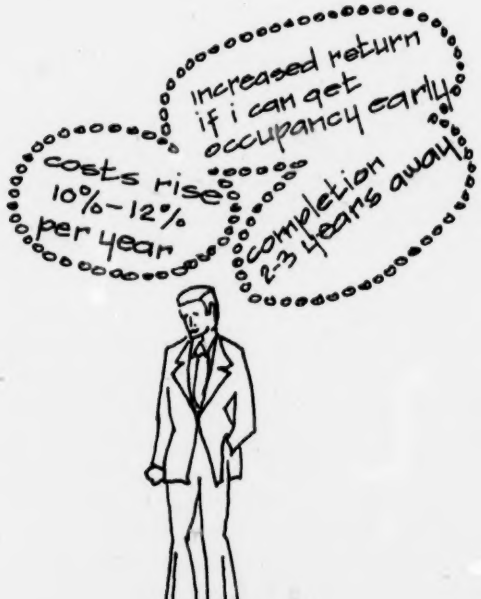
HOW DO WE BUILD FASTER AND CHEAPER?

It was noted earlier that building has become an unreasonably lengthy process, and as a result, inflation causes substantial increases in construction costs.

In response to these problems there is a fast-growing movement toward the use of two techniques which compress the time required to plan and construct a building and, at the same time, reduce its cost.

These techniques are:

- FAST TRACK
- CONSTRUCTION MANAGEMENT



FAST TRACK

FAST TRACK—or phased construction, which more descriptive but less catchy term—is a m for overlapping phases of the design-construc process. It really is not necessary that each st the process be completed in detail before the step is started. It is a rethinking of the constru process and a positive action program based that rethinking.

Traditionally, a project is begun with the prep of a detailed program which usually takes mo sometimes years, to complete. When this pro has been approved, the architect begins the preparation of schematic designs. When these schematics satisfy the client as an expression program, and they are approved by him, the a starts the development and refining called des development. When this is completed and app he prepares the contract documents—working drawings and specifications. Only when these completed—covering everything from parking carpeting—and after months of work, are bids and construction started. It is not at all unusu this process to take two or three years to com Construction then adds from one to two or th depending on the size of the project. At the s time, inflation has been at work, with costs in each month as planning goes on.

With FAST TRACK, these activities are restru such a way that there is a drastic reduction in time involved. The steps involved (programmi schematics, design development, contract documents, bidding, construction) are reorga that early decisions and actions can be taken portions of the project, planning completed a construction started while detailed work cont the remaining portions. For example:

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NAGEMENT

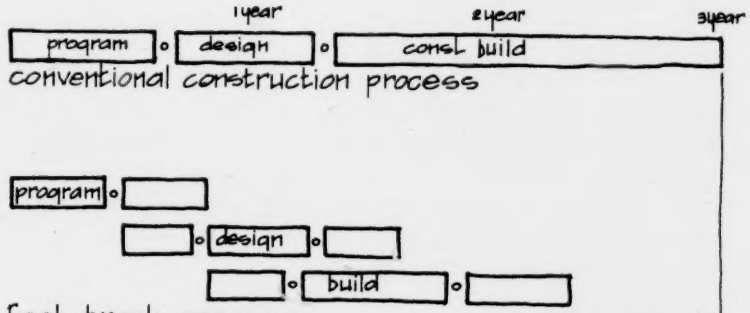
FAST TRACK

FAST TRACK—or phased construction, which is a more descriptive but less catchy term—is a method for overlapping phases of the design-construction process. It really is not necessary that each step in the process be completed in detail before the next step is started. It is a rethinking of the construction process and a positive action program based upon that rethinking.

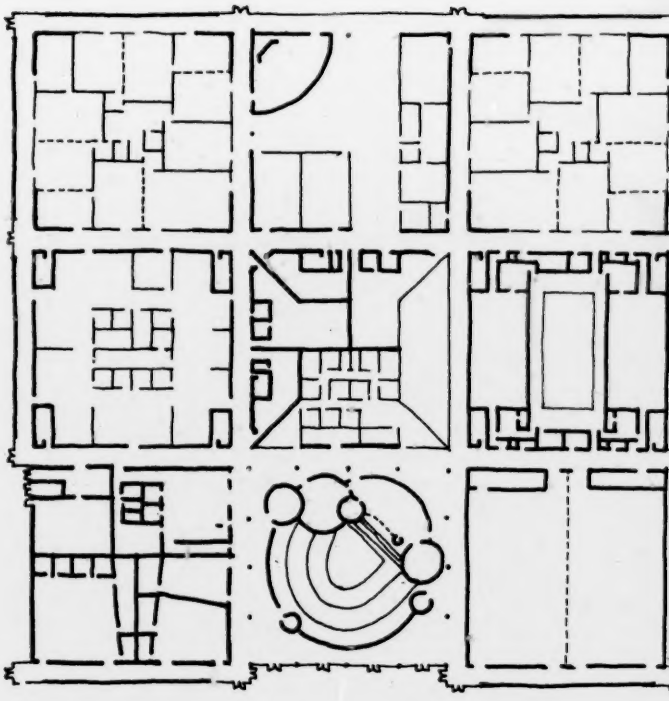
Traditionally, a project is begun with the preparation of a detailed program which usually takes months, sometimes years, to complete. When this program has been approved, the architect begins the preparation of schematic designs. When these schematics satisfy the client as an expression of his program, and they are approved by him, the architect starts the development and refining called design development. When this is completed and approved, he prepares the contract documents—working drawings and specifications. Only when these are completed—covering everything from parking lots to carpeting—and after months of work, are bids taken and construction started. It is not at all unusual for this process to take two or three years to complete. Construction then adds from one to two or three years depending on the size of the project. At the same time, inflation has been at work, with costs increasing each month as planning goes on.

With FAST TRACK, these activities are restructured in such a way that there is a drastic reduction in the total time involved. The steps involved (programming, schematics, design development, contract documents, bidding, construction) are reorganized so that early decisions and actions can be taken on portions of the project, planning completed and construction started while detailed work continues on the remaining portions. For example:

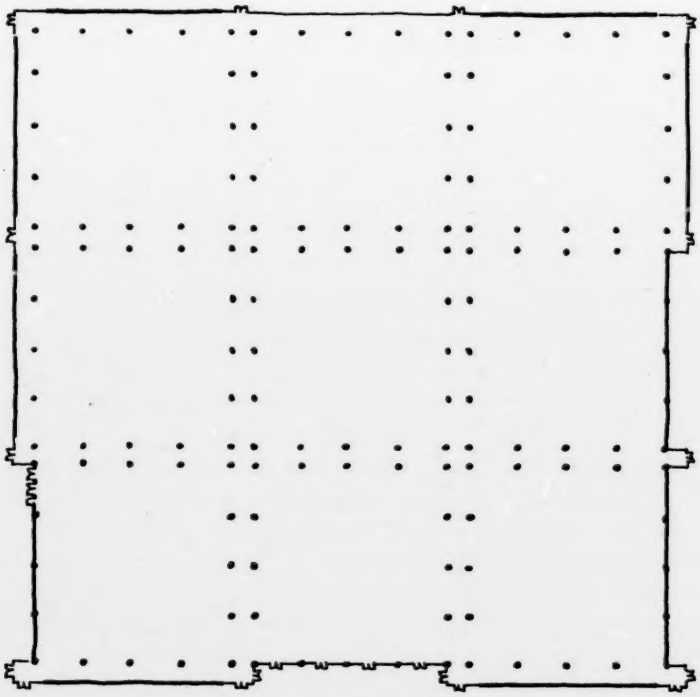
- Site development can be programmed early, design can be established and construction started while programming and design proceed on the building itself.
- Overall space requirements can be programmed and schematic design completed. Contract documents can then be prepared for foundations, structure and enclosure (exterior walls, roof). These can be bid and construction started while detailed work continues on interior space arrangements, equipment, etc.
- Interior detail work (partitions, lighting, heating, equipment, etc.) can be completed and bid while the earlier work is already well under construction.



This simplified bar graph shows how FAST TRACK works, with the overlapping of activities resulting in a shorter overall period of time required.



This is the schematic plan of a school as actually approved by a Board of Education. Everyone was satisfied at this point that the basic space needs were satisfied and that the relationships of activities to one another were as desired. At the same time, there were a multitude of decisions remaining to be made about the exact configuration of interior spaces and equipment. Occupancy was a major concern, so it was decided at this point to go FAST TRACK. (It was already a SYSTEMS project and became a CONSTRUCTION MANAGEMENT project, which is discussed later).



This plan shows the elements that were included in the first group of FAST TRACK bids: Site Development, Foundations, Structure, Exterior Walls, Doors, Windows, Metal Deck, Roofing and Insulation. This accomplished enclosure early so that work could proceed during the winter, substantially decreasing total construction time. A little study will indicate the almost complete freedom at this point in planning the interior even though almost 30% of the building was under contract. The project ultimately had about 40 separate contracts.

CONSTRUCTION MANAGEMENT

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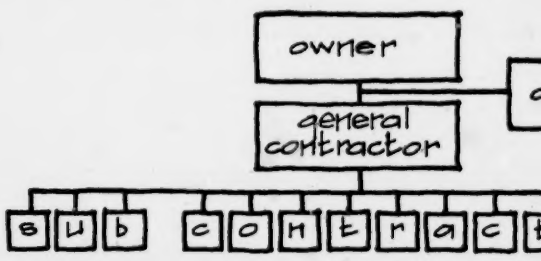

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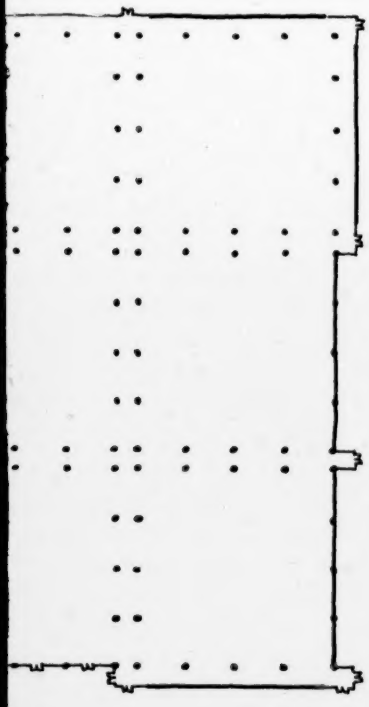

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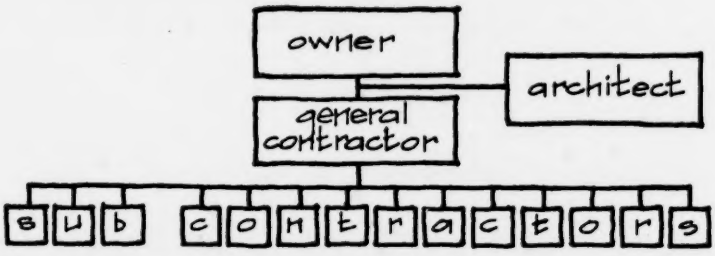
CONSTRUCTION MANAGEMENT

As the FAST TRACK concept began to take hold it became apparent that a management problem was beginning to develop. Traditionally, there had been a general contractor on the job. Even though there might have been separate mechanical and electrical contracts, the general contractor was responsible for 60-70% of the total construction cost. He was either assigned or assumed the overall management function, usually with substantial help from the architect.

The change in construction logic involved the FAST TRACK process, where there usually was no contractor on the job from start to finish, left a management void. There may be, and there often are, general contractors on a FAST TRACK project, but their relationship to the job as a whole is changed. To fill this void, a new creature, the construction manager, has evolved to perform the CONSTRUCTION MANAGEMENT function.

CONSTRUCTION MANAGEMENT establishes a new set of relationships among the participants in a construction project.

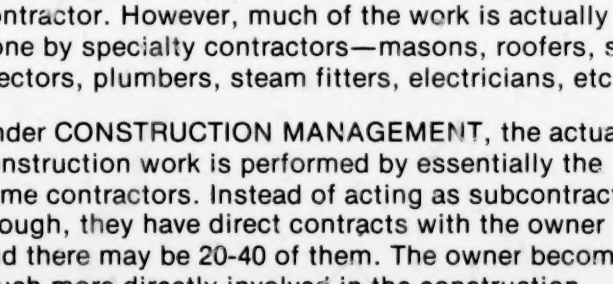


This chart graphically illustrates the traditional structure in a construction project.

The general contractor on a traditional project is usually the low bidder, selected not for his ability,

reputation or competence, but for his price. The owner has a single fixed price contract with the general contractor. However, much of the work is actually done by specialty contractors—masons, roofers, steel erectors, plumbers, steam fitters, electricians, etc.

Under CONSTRUCTION MANAGEMENT, the actual construction work is performed by essentially the same contractors. Instead of acting as subcontractors though, they have direct contracts with the owner and there may be 20-40 of them. The owner becomes much more directly involved in the construction process and with the architect and the construction manager, forms the management team.



This chart illustrates the CONSTRUCTION MANAGEMENT structure.

Who is the CONSTRUCTION MANAGER?

To begin with, the CONSTRUCTION MANAGER for a specific project is a person or firm who provides a service for a fee and has no financial interest in the construction. (There are exceptions to this broad statement in the many variations of CONSTRUCTION MANAGEMENT practiced today and these will be considered separately as variations.)

The person, or more probably the firm CONSTRUCTION MANAGEMENT ser someone knowledgeable in current m techniques and methods and with bro construction processes. The CONSTR MANAGER is both more than and les contractor. He provides services outs those usually prov ed by a general c the same time does ot undertake so responsibilities of the general contrac

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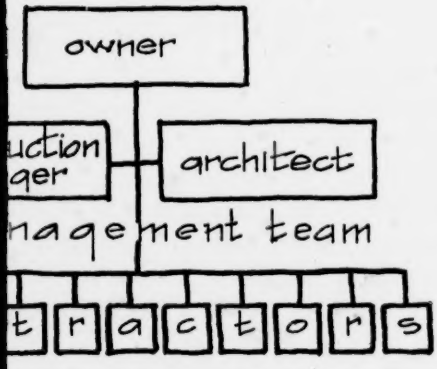

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The person, or more probably the firm, who offers CONSTRUCTION MANAGEMENT services must be someone knowledgeable in current management techniques and methods and with broad experience in construction processes. The CONSTRUCTION MANAGER is both more than and less than a general contractor. He provides services outside the scope of those usually provided by a general contractor, and at the same time does not undertake some of the responsibilities of the general contractor.

There are many kinds of firms offering CONSTRUCTION MANAGEMENT services. It is a new field, apparently with a great potential for business, so everyone wants some of the action. Among the major categories of kinds of firms presently involved are the following:

ARCHITECTS: Most of the pioneering work in the use of CONSTRUCTION MANAGEMENT in public construction has been by architectural firms. These firms have been involved in FAST TRACK, so a movement into the management of the FAST TRACK construction is a natural one. The architect has the advantage of his background in providing services on a professional basis, he is knowledgeable in the process of working with an owner and he is already "on-board" in the early stages of the project (when the management process really should begin). If the architectural firm is a substantial one with a reputation for excellence in its complete professional services, it probably will provide the same kind of management services.

GENERAL CONTRACTORS: Many general contractors have become interested in providing CONSTRUCTION MANAGEMENT services. With their kind of background in construction it is natural that they should do so. This is a new kind of relationship for most general contractors, requiring some philosophical adjustment on their part. However, as

with architects, if the firm is one with an outstanding reputation in construction it probably will work towards the same reputation in management. It is interesting to note that a number of contractors who have not generally been interested in bidding on public work are interested in management services for public work.

CONSULTANTS: There are a variety of consulting firms in the construction industry in such areas as engineering, construction processes and techniques, scheduling, estimating, etc. A number of these firms have expanded into management areas.

TEAMS: A logical development in the field has been the joining of two or more firms, an architect and a general contractor for example, into a management team. In this way the strengths and experience of each of the members of the team is brought to bear on the process.

How do we pick a CONSTRUCTION MANAGER?

The CONSTRUCTION MANAGER should be selected in the same manner as an architect, attorney, accountant, etc., is selected. The criteria should be experience, background, knowledge and competence. The firm should be the one you feel will do the best job for you and the one in whom you have the most confidence.

How much will CONSTRUCTION MANAGEMENT cost?

Building under the CONSTRUCTION MANAGEMENT process will not cost any more than building in the traditional manner. In fact, because of the time reductions involved, it probably will cost less. The construction manager will, of course, be paid a fee.

As with most products and services, it is always possible to get something cheaper. However, you usually get only what you pay for. For quality services—and for the CONSTRUCTION MANAGEMENT technique to work—the provided should be spelled out in detail reasonable fee paid for them.

What does a CONSTRUCTION MANAGE

As the term implies, he manages all of t of activities which make up the construc and, in addition, he provides a number o services required for the process.

Included among these activities and serv following:

- The establishment of job organization responsibilities, including the activitie owner, architect, construction manage contractors.
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- The establishment of project budgets planning progresses, estimating the c various phases of the work.
- Provide financial and other reports on basis and keep appropriate records.
- Analyze alternative construction meth materials in terms of cost and time co
- Manage on-site activities.
- Work with the architect in establishin procedures, obtaining govermental ag approvals, recommending award of co
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MANAGEMENT technique to work—the services to be provided should be spelled out in detail and a reasonable fee paid for them.

What does a CONSTRUCTION MANAGER do?

As the term implies, he manages all of the multitude of activities which make up the construction process and, in addition, he provides a number of technical services required for the process.

Included among these activities and services are the following:

- The establishment of job organization and responsibilities, including the activities of the owner, architect, construction manager and contractors.
- The administration and coordination of all activities.
- The scheduling of all activities throughout the planning and construction phases, and their monitoring on a regular basis.
- The establishment of project budgets and, as planning progresses, estimating the cost of the various phases of the work.
- Provide financial and other reports on a regular basis and keep appropriate records.
- Analyze alternative construction methods and materials in terms of cost and time considerations.
- Manage on-site activities.
- Work with the architect in establishing bidding procedures, obtaining govermental agency approvals, recommending award of contracts, etc.
- There are many other detailed or specialized services which might be included for a specific project.

What does the OWNER have to do?

The owner becomes a more active participant when

FAST TRACK and CONSTRUCTION MANAGEMENT are used, especially during the construction phase. He is very much involved in day-to-day decision-making as a member of the management team, much of which would be done by the general contractor under that form of construction. Before becoming involved in this process the owner should recognize that it is different, should be receptive to it and be prepared for the changes in attitude required.

The owner should particularly be aware of the following areas where he will need to adjust his thinking:

- INVOLVEMENT: Be prepared to spend a great deal of time and effort and to act promptly when decisions are required. One of the major sources of delay in building programs is the owner. This occurs in the failure to recognize a sense of urgency early in a project and from a cumbersome and time consuming procedure for decision-making during planning and construction. This entire concept is geared to reducing time and working to a schedule. The owner must participate fully as a member of the team, meeting the time commitments established for him.
- DELEGATION OF AUTHORITY: As a part of his involvement, it is essential that the owner delegate a substantial degree of authority to the administrative level. This should be the maximum possible within the abilities of the staff to whom it is delegated and within any legal limitations of the policy making body. It should, for example, delegate the approval of changes within defined limitations.
- CONSTRUCTION COST: Owners are accustomed to receiving bids based upon complete drawings and specifications; thus contracts are awarded with a degree of certainty as to the final cost. At this point the responsibility for completing the project at this cost presumably falls upon the g
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In the FAST TRACK/CONSTRUCTION MANAGEMENT concept, bids are taken and contracts awarded over a period of time. The project is well under way before final contracts are awarded and a total cost is known. Thus the owner is taking a more direct and a more visible responsibility for the final cost, but not really a greater actual responsibility. In reality, the awarding of smaller phased contracts gives adjustments when bids are high.

- COORDINATION: The owner should be prepared for the possibility of more changes during construction than with the traditional process and, as a result, more change orders. There are two major reasons for this:
  - There will be occasions where it is not desirable to bid all of the work of a particular trade early and rather than there being a second contractor on the job for the same trade, it may be advantageous to add this work to an existing contract.
  - Phasing of construction documents is inherently subject to greater difficulty in coordination. As a result, there may be inadvertant omissions to be accommodated and changes required.

  These possibilities should be anticipated when the initial budget is established and a contingency fund provided for them.

Are there LEGAL questions involved?

Yes. There are legal questions, as there are with any construction project.

The owner's attorney should be very much involved, and he should be given a complete explanation of the

process upon which to base his involvement. FAST TRACKING and CONSTRUCTION MANAGEMENT have been used by a number of school districts within the limitations of the laws under which they operate. However, attorneys' opinions vary, and variations in procedure, even though minor, could raise new legal questions. The owner utilizing these concepts should assure himself that all legal requirements are met.

A second area where legal questions arise is in the approvals required for construction projects. Schools require the approval of the State Department of Education and the State Fire Marshal, as well as approval of local building and planning officials, health departments, etc. These authorities generally do not have procedures established for the approval of FAST TRACK projects. Consequently, it is essential that they be brought into the planning as early as possible and that they be closely involved throughout in order to ensure their cooperation and to make it possible for them to fulfill their legal responsibilities in this different procedure.

Where can I learn more about FAST TRACK and CONSTRUCTION MANAGEMENT?

READ:

Professional Construction Management and Project Administration—Foxhall; published by Architectural Record, New York.

"Fast Track"—*American School Board Journal,* August 1971.

"A Fast Track to Savings in College Building"—*College Management,* July 1969.

"Construction Manager: More Than a Hard-Hat Job"—*AIA Journal,* May 1971.

"Construction Management"—*Engineering News Record,* May 4, 1972.

"Construction Management: Seeking Better Buildings"—*National Electrical Contractors Association,* Monograph 22.

RECYCLING EXISTING BUILDINGS

RECYCLING—The "in" term for remodelin with broader implications—is another CONSTRUCTION OPTION that should be c RECYCLING implies a new life for old facil upon a consideration of *educational* needs an updating based upon physical needs—f acoustics, heating and ventilating, etc.

In Document 3 *"Facility Options",* it has be suggested that existing buildings—both th presently educational and those non-educa use—should be considered as potential ca facilities. Any such considerations should a comprehensive feasibility study and evalu which would establish the suitability of the for remodeling and for use as a career prep facility.

RECYCLING is an option which may result time savings. The concepts of SYSTEMS, FAST TRACK and CONSTRUCTION MANA are also options which are used for cost an saving benefits. These concepts are applic RECYCLING process, as well as to new co

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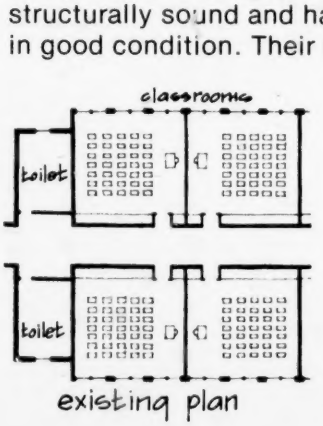


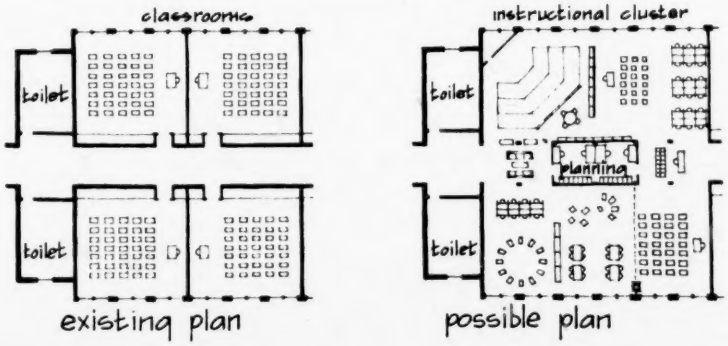
RECYCLING EXISTING BUILDINGS

RECYCLING—The "in" term for remodeling, although with broader implications—is another CONSTRUCTION OPTION that should be considered. RECYCLING implies a new life for old facilities based upon a consideration of *educational* needs rather than an updating based upon physical needs—fire safety, acoustics, heating and ventilating, etc.

In Document 3 *"Facility Options"*, it has been suggested that existing buildings—both those presently educational and those non-educational in use—should be considered as potential career facilities. Any such considerations should begin with a comprehensive feasibility study and evaluation which would establish the suitability of the building for remodeling and for use as a career preparation facility.

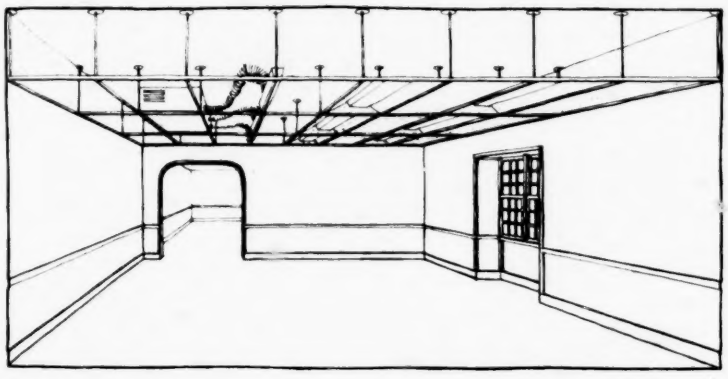
RECYCLING is an option which may result in cost and time savings. The concepts of SYSTEMS, FAST TRACK and CONSTRUCTION MANAGEMENT are also options which are used for cost and time saving benefits. These concepts are applicable to the RECYCLING process, as well as to new construction.

Many older buildings, including schools, are structurally sound and have exterior "skins" which are in good condition. Their major inadequacies lie in



their interior arrangements and equipment. It is often possible to rework the interiors of these buildings so that large open spaces are created, in which new educational activities can take place. The illustration shows how a typical double-loaded corridor section of an older school might be opened up into a more useful instructional area.

It is sometimes possible, too, to superimpose the planning module grid on these newly opened up areas, and to use some of the subsystems described earlier in their remodeling. The ceiling-lighting; heating, ventilating, air conditioning; and various partitioning subsystems might adapt very well to these areas. In fact, several producers are marketing systems specifically designed for remodeling. These systems (see illustration) include ceiling, lighting, heating, ventilating, air conditioning, and sometimes, other electrical, communications and audio-visual equipment.



Remodeling projects are usually much more complicated than new buildings. Consequently, they lend themselves to FAST TRACK and CONSTRUCTION MANAGEMENT techniques. The greater flexibility in management and scheduling inherent in these techniques can be very useful in accomplishing RECYCLING in an orderly and controlled manner.

Where can I learn more about RECYCLING?

Educational Facilities Laboratories, Inc. has established NEW LIFE FOR OLD SCHOOLS PROJECT specifically to be concerned with RECYCLING. A wealth of experience and knowledge is available, including SYSTEMS applications in Portland, Chicago, Kansas City and Fairfax County, Virginia.

WRITE:

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Suite 1734
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READ:

School Renewal—McLeod Ferrara Ensign, AIA
Educational Facilities Laboratories, Inc.

Places and Things for Experimental Schools,
Educational Facilities Laboratories, Inc.

"Packaged System: A New Hybrid for Old Schools", *Air Conditioning and Refrigeration Business,* September, 1972.